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Manual Therapy, Physical Therapy, or Continued Care by the General Practitioner for Patients With Neck Pain

Long-Term Results From a Pragmatic Randomized Clinical Trial

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Objectives: The authors' goals were to compare the effectiveness of manual therapy (MT; mainly spinal mobilization), physical therapy (PT; mainly exercise therapy), and continued care by the general practitioner (GP; analgesics, counseling and education) over a period of 1 year.

Methods: One hundred eighty-three patients suffering for at least 2 weeks from nonspecific neck pain were randomized to receive a 6-week treatment strategy of MT once a week, PT twice a week, or GP care once every 2 weeks. The primary outcome measures were perceived recovery, severity of physical dysfunctioning, pain intensity, and functional disability.

Results: The differences between groups considered over 1 year were statistically significant (repeated measurements analyses $P < 0.001$ to $P = 0.02$) for all outcomes but borderline for the Neck Disability Index ($P = 0.06$). Higher improvement scores were observed for MT for all outcomes, followed by PT and GP care. The success rate, based on perceived recovery after 13

weeks, was 72% for MT, which was significantly higher than the success rate for continued GP care (42%, $P = 0.001$) but not significantly higher compared with PT treatment (59%, $P = 0.16$). The difference between PT and GP approached statistical significance ($P = 0.06$). After 1 year the success rates were 75%, 63%, and 56%, respectively, and no longer significantly different.

Conclusions: Short-term results (at 7 weeks) have shown that MT speeded recovery compared with GP care and, to a lesser extent, also compared with PT. In the long-term, GP treatment and PT caught up with MT, and differences between the three treatment groups decreased and lost statistical significance at the 13-week and 52-week follow-up.

Key Words: neck pain, manual therapy, physical therapy, general practice, long-term effects, randomized clinical trial

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Neck pain is one of the most common, painful musculoskeletal conditions. Point prevalences have been reported to vary between 10% and 22%,^{1–5} and lifetime prevalences as high as 67% and 71% have been reported.^{3,4} Neck pain complaints are often self-limiting within a few weeks of onset, but they can also severely limit daily functioning and result in prolonged sick leave and disability. However, the natural course of neck pain remains unclear.⁶ In The Netherlands, most patients receive conservative treatment from a general practitioner (GP) or a physical therapist.^{5,7} Physical therapy (PT) may include exercise therapy, stretching, traction, massage, electrotherapies, thermal agents, ultrasound, and education. Physical therapists also perform manual techniques on the cervical spine. Some of the manual therapy (MT) techniques require extensive training before they can be performed in a safe and skillful manner. In The Netherlands, physical therapists can further specialize in MT theory and techniques during a 3- to 4-year part-time course and register themselves as manual therapists.⁸

There is surprisingly little information available from randomized clinical trials (RCTs) on the effectiveness of

conservative treatments for neck pain.^{9–11} Reviewing the literature, a combination of MT and PT, including exercises, appears to produce the most promising results.^{9,10} No single treatment modality seems to be effective.^{9–11} In general, however, none of these therapies has been studied in sufficient detail to enable firm conclusions to be drawn.^{9–11} Moreover, the studies that have been carried out are very heterogeneous with regard to methodologic quality, study populations, interventions, reference treatments, and outcome measures. Another drawback is that the available RCTs typically lack the power to detect clinically relevant differences between interventions. In a recent review, more than half of the studies appeared not to have a long-term follow-up.¹⁰

We performed a pragmatic RCT to investigate whether GPs should treat patients with nonspecific neck pain themselves or whether it is better to refer these patients to a physical therapist or a manual therapist. In an earlier publication we reported on the short-term beneficial effects of MT and PT, compared with continued care by the GP, in patients with neck pain.¹² The objective of this study was to examine whether the short-term effects in favor of MT that were found in the RCT directly after the intervention would remain in the long term. Therefore, we compared the effects of the three treatment strategies again at 13 weeks, 26 weeks, and 52 weeks of follow-up.

METHODS

This study was approved by the Medical Ethical Committee of the VU University Medical Center.

Participants

Patients from 42 GPs were referred to one of four local research centers. Patients had to meet the following inclusion criteria: aged 18 to 70 years, pain and/or stiffness in the neck for at least 2 weeks, nonspecific neck complaints reproducible during active or passive range of motion, willingness to adhere to treatment and measurement regimens, and written informed consent. Nonspecific neck pain was defined as no specific cause for the pain, such as systemic disease, fracture, or other organic disorder. Patients with a history of trauma or additional complaints, such as headache or nonradicular pain, were included only if the neck pain was dominant. Patients who underwent previous surgery for neck complaints were excluded, as were patients who had received PT or MT in the previous 6 months.

Randomization and Data Collection

A researcher not involved in the project prepared opaque, sequentially numbered envelopes containing folded cards indicating one of the three interventions, based on a computer-generated random sequence table using block randomization (block size 6). Prestratification for the design factors severity of the complaints (scored on a 0–10 scale [< 7 , low severity; ≥ 7 , high severity]), age (< 40 years or ≥ 40 years), and, for practical reasons,

the research center (four local centers) was applied. An administrative research assistant allocated the patients to one of the three intervention groups, according to the randomization scheme (concealed randomization). Two independent research assistants (with > 10 years of experience as manual and physical therapists), who were blinded to the allocated treatment, performed the physical examinations. All other outcome assessments consisted of self-administered questionnaires.

Interventions

The three treatment strategies in this study are frequently applied treatments by physical therapists, manual therapists, and GPs in the Netherlands. It is common for manual therapists to see their patients once a week for about 45 minutes and physical therapists to see their patients twice a week for about 30 minutes. This pattern was followed in the current trial. The frequency and duration of GP consultations for neck pain varies, and the protocol proposed a frequency of once every fortnight for 10 to 20 minutes. We used the terms “physical therapy” and “manual therapy” in this study to characterize these multimodal treatment strategies, which correspond with the professional titles (“physical therapist” and “manual therapist”) in The Netherlands. As the use of these terms is not straightforward,¹³ the specific treatment components of each strategy are discussed below. Each of the three treatment strategies was applied at the practitioner’s own discretion. All GPs, physical therapists, and manual therapists involved in the treatment of the patients had more than 5 years of experience in clinical practice.

Manual Therapy Strategy

During the 6-week intervention period, the MT strategy consisted of muscular, specific articular (or spinal) mobilization, and coordination or stabilization techniques (exercises) to treat segmental movement dysfunction.^{14,15} Mobilization can be described as low-velocity passive movements (including segmental translatory or accessory glides and segmental physiologic movements) within or at the limit of joint range of motion.¹⁴ During treatment, the manual therapists could instruct patients to perform exercises at home. A maximum of six treatment sessions during 6 weeks were provided by six registered manual therapists (physical therapists specializing in MT).

Physical Therapy Strategy

The PT strategy consisted of individualized exercise therapy, including active, passive, postural, stretching, relaxation, and functional exercises. Manual traction or massage could precede exercise therapy if needed. Advanced manual mobilization techniques as applied by manual therapists were not included in this protocol. A maximum of 12 treatment sessions during 6 weeks were provided by five experienced physical therapists not specialized in MT.

Continued Care by the GP

The treatment strategy by the GP was based on the practice guidelines for low back pain of the Dutch College of General Practitioners¹⁶ and included counseling and advice regarding the favorable prognosis, importance of staying active, role of psychosocial factors, self-care (heat application, home exercises), and ergonomic advice (eg, size of pillow, work position). In addition, patients received an educational booklet containing ergonomic advice and exercises for the neck.¹⁷ Analgesics (paracetamol or nonsteroidal anti-inflammatories), if necessary, were prescribed on a time-contingent basis. Two weekly 10-minute follow-up visits were optional, and referrals during the intervention period were discouraged.

Co-interventions

After the intervention period of 6 weeks, any further treatment was left to the discretion of the patient's GP. Co-interventions were discouraged in all groups but were recorded during the course of 1 year.

The influence of a number of potential prognostic factors was examined in the analyses. These included research center, the severity of physical dysfunctioning at baseline, age, sex, duration of complaints (≤ 6 weeks or > 6 weeks), a history of neck pain, concurrent headache or low back pain, progression of neck complaints before randomization (categorized as worse, the same, better), the cause (categorized as unknown, trauma and non-trauma), preference of treatment (categorized as did receive preferred treatment, no preference, did not receive preferred treatment), and having previously received PT or MT.

Outcome Measures

The long-term effects were measured at 13, 26, and 52 weeks. The short-term effects at 3 and 7 weeks have been reported elsewhere.¹² The primary outcome measures included global perceived recovery, physical dysfunctioning, pain intensity, and neck disability. To assess global perceived recovery, patients rated the effect of treatment on an ordinal 6-point scale ranging from "much worse" to "completely recovered." Recovery was defined as "completely recovered" or "much improved." Global perceived recovery is a measure that is considered to be valid because of its correlation with pain and disability measures.¹⁸ Although it is known that it might correlate more with the current health status than with the previous health status,¹⁹ it is advocated as a useful outcome measure to capture the patient's view of change in clinical trials.¹⁸ However, the reliability of this measure is difficult to assess. Physical dysfunctioning was assessed by the research assistant after a physical examination (including an assessment of passive and active range of motion, pain, and palpation) on a numeric 11-point scale ranging from 0 (no physical dysfunction) to 10 (maximal dysfunction). This measure has a high face validity for the physical therapists because it closely corresponds to their judgment in clinical practice, but the reliability of this measure is unknown. Pain intensity was assessed as

average pain in the previous week measured on a numeric 11-point scale (higher scores indicating more pain). This is a valid and reliable pain measure.²⁰ Functional neck disability was measured using the Neck Disability Index (NDI),^{21–23} which scores 10 items concerning pain and activities of daily life on a scale from 0 to 5 (maximal disability score 50 points). The reliability and validity of the NDI has been shown to be acceptable,²¹ but its responsiveness to change has not been established.

The secondary outcome measures included the severity of the most important functional limitation, rated by the patient on a numeric 11-point scale²⁴; range of motion of the cervical spine in flexion-extension, lateral flexion, and rotation measured with a Cybex Electronic Digital Inclinator 320 (Lumex, Inc., Ronkonkoma, NY)²⁵; and general health status according to the self-rated health index (0–100) of the Euro Quality of Life scale (Euroqol).²⁶ The measurement at 26 weeks consisted only of a postal questionnaire that excluded the outcomes physical dysfunctioning and range of motion. Any additional treatment after 7 weeks (allocated treatment or other co-interventions) was also included as an outcome measure.

Statistical Analysis

Raw change scores between the baseline and 13- or 52-week follow-ups were calculated for all continuous outcomes, and recovery rates for perceived recovery. According to the intention-to-treat principle,²⁷ repeated measures of covariance (ANCOVA) were performed to test for group differences (P values), including all available measurements up to 52 weeks for each of the continuous outcomes. In addition, mean differences between groups and their respective confidence intervals were constructed at 13 weeks and 52 weeks using analyses of covariance (ANCOVA), with adjustment for baseline.²⁸ The differences in success rates for perceived recovery were analyzed by Cox regression analyses (including all available measurements up to 52 weeks) and chi-square tests at 13 and 52 weeks of follow-up. Analyses were performed with SPSS for Windows, Version 11.5 (SPSS, Chicago, IL). For all comparisons, $P < 0.05$ was considered statistically significant (two-tailed). If the 95% confidence interval (CI) of the difference does not include the value 0, the difference is statistically significant (at $P < 0.05$).

RESULTS

Patient Selection and Follow-Up

During a period of 21 months, 183 patients were included, 178 of whom completed the 1-year follow-up measurement (Fig. 1). Reasons for loss to follow-up are presented in Figure 1. Patients who withdrew were included in the analysis until the time of withdrawal, after which the group mean (continuous outcomes) or median (perceived recovery) was used to impute the missing data. The pain questionnaires of one patient

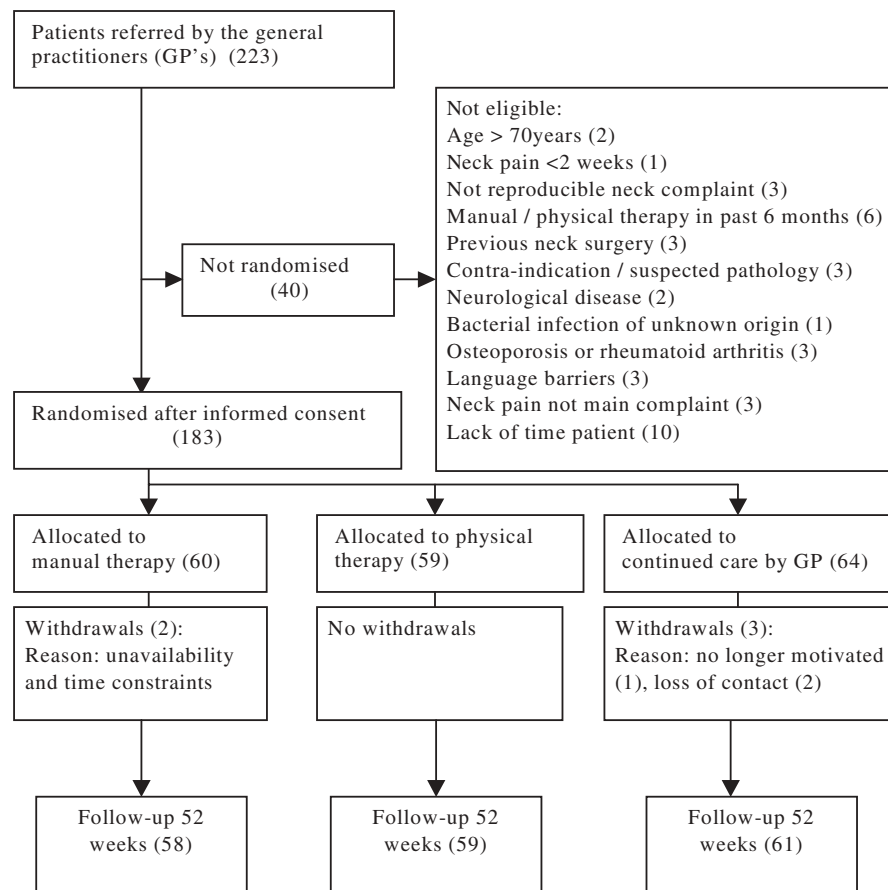


FIGURE 1. Flow chart describing the progress of patients through the trial.

* Between parentheses: number of patient

(MT group) were lost for all measurements, and these missing data were not imputed.

Outcomes Over the 1-Year Period

At baseline, only minor differences in potential prognostic factors were found between the three groups,¹² and adjustment was limited to the baseline outcomes of the respective outcome measure (ANCOVA). Figure 2 shows the outcomes for the primary outcomes (perceived recovery, physical dysfunctioning, pain, and functional disability) during the entire 1-year follow-up.

Improvement in the MT group was already maximal directly after the intervention period and thereafter increased only slightly. In the PT group, no major improvement was seen after 13 weeks. The patients allocated to the GP care group improved considerably after the intervention period, and this continued up to 52 weeks. Considering effectiveness over one year (ANCOVA), differences were statistically significant (repeated measurements analyses, $P < 0.001$ to $P = 0.02$) for all outcomes but borderline for the NDI ($P = 0.06$). Higher improvement scores were observed for MT for all outcomes, followed by PT and GP care.

Outcomes at 13 Weeks and 1 Year of Follow-Up

Because the 26-week results were similar to those of 13 weeks (see Fig. 2), we show only the results at 13 and 52 weeks in Table 1. As confounding scarcely influenced the results, only the unadjusted differences are presented. Pairwise comparisons show a 30% difference in success rate for perceived recovery between MT and GP care at 13 weeks (95% CI 13–46%) and a 15% difference at 52 weeks (95% CI –1% to 32%). Differences in success rates between PT and GP care at 13 weeks (difference 17%, 95% CI –0.3 to 34.6) and 52 weeks (difference 7%, 95% CI –11 to 23.8) were in favor of PT but not statistically significant. Likewise, MT showed larger success rates than PT, but these differences were not statistically significant (13 weeks' difference 12%, 95% CI –4.6 to 29.3; 52 weeks' difference 9% (95% CI –7.9 to 25.8).

The results with regard to the severity of physical dysfunctioning, pain intensity, and the NDI scores show similar trends (see Fig. 2), with most improvement seen in the MT group. A greater decrease in the severity of physical dysfunctioning was seen in the MT and PT groups compared with the GP care group at 13 weeks: 1.6 (95% CI 0.8–2.3) and 1.3 (95% CI 0.5–2.1), respectively.

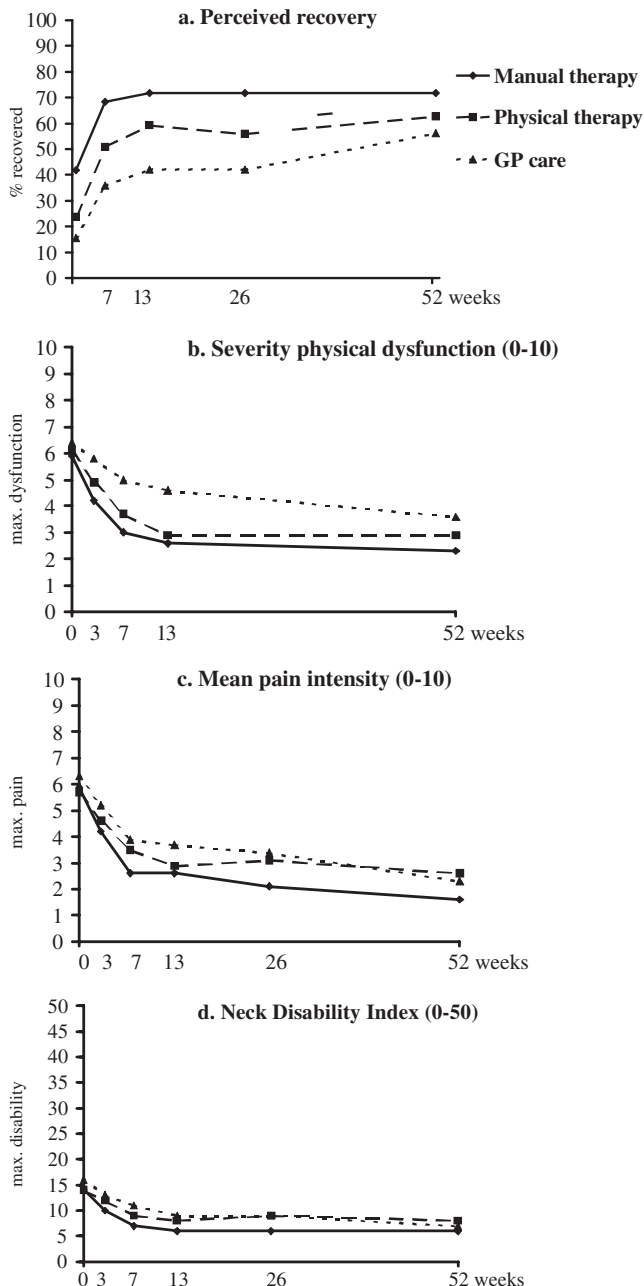


FIGURE 2. Results of primary outcome measures during the 1-year follow-up.

Modest differences between MT and GP care in favor of MT were seen for pain intensity at 13 weeks (difference 0.9, 95% CI 0.1–1.8) and between MT and PT at 52 weeks (difference 1.0, 95% CI 0.1–1.9). Despite improvement of at least 6 points in NDI scores by each group (baseline minus 13 and 52 weeks), the between group differences during the course of the trial remained small (2 points or less) and not statistically significant. As shown in Table 1, the secondary outcome measures showed the same trends.

Additional Treatment During Follow-Up

Many patients received one or more additional types of treatment during the entire follow-up period (Table 2): 40 of the 64 patients (63%) in the GP group, 34 of the 59 patients (58%) in the PT group, and 18 of the 60 patients in the MT group (31%). In the GP group, these referrals were mainly for MT or PT. Most of these referrals (29/40) in the GP care group took place directly after the intervention period.

DISCUSSION

This article presents the long-term results of MT, PT, and GP care for patients with neck pain. To evaluate effectiveness, we looked at how the differences in effects developed over the year, and then evaluated the measurements at 13 and 52 weeks individually. During the course of 1 year, there were significant differences between the intervention groups. MT was more effective than GP care and slightly more effective than PT. In general, differences between PT and GP care were nonsignificant. PT appeared to be somewhat more effective with regard to perceived recovery and severity of physical dysfunction compared with GP care, but not for pain intensity and disability measured by the NDI. The largest differences in improvement between the groups were seen directly after the intervention period and at 13 weeks, but the differences decreased in magnitude thereafter.

The treatment advantage of MT was emphasized by the outcome that almost twice as many patients in the PT and GP care groups received additional treatments compared with the MT group. It remains unclear to what extent these additional treatments have contributed to the catch-up in recovery rates observed in the GP and PT treatment groups. The additional treatments have consequences for the cost-effectiveness analysis of this study, which is reported elsewhere.²⁹

This study was designed as a pragmatic RCT, answering a question that originates from clinical practice. A relevant question for GPs is whether they should treat patients with nonspecific neck pain themselves, or whether it is better to refer these patients for PT or MT. In a pragmatic RCT, the content of the interventions should be the same as in clinical practice. This might imply differences in the amount of attention and difference in expertise with regard to spinal disorders. Physical therapists had the most contact time with patients, followed by manual therapists. GPs had substantially less contacts (in terms of the frequency and duration of visits). Manual therapists probably have more expertise in treating patients with neck pain, as they have received more training on spinal disorders compared with physical therapists and GPs, and they treat a relatively large number of patients with neck pain. Therefore, part of the differences between treatment effects may be attributable to differences in attention and expertise between the treatment groups. However, these differences are inherent in the interventions as they

TABLE 1. Primary Outcome Measures: Mean Improvement From Baseline and Unadjusted Difference of Mean Improvement Between Groups After 13 and 52 Weeks*

Variable	MT	PT	GP Care	Difference MT-GP (95% CI)	Difference PT-GP (95% CI)	Difference MT-PT (95% CI)	P Value (0–52 weeks)
Perceived Recovery (%)	Success Rate (number of patients)			Difference in Success Rate			0.02
13 weeks	71.7 (43)	59.3 (35)	42.2 (27)	29.5 (12.9, 46.1)	17.1 (–0.3, 34.6)	12.3 (–4.6, 29.3)	
52 weeks	71.7 (43)	62.7 (37)	56.3 (36)	15.4 (–1.3, 32.1)	6.5 (–10.9, 23.8)	9.0 (–7.9, 25.8)	
Severity Physical Dysfunction (0–10)	Mean Improvement			Difference in Mean Improvement†			0.000
13 weeks	3.4 (2.3)	3.2 (2.3)	1.9 (2.5)	1.6 (0.8, 2.3)	1.3 (0.5, 2.1)	0.2 (–0.6, 1.0)	
52 weeks	3.7 (2.1)	3.3 (2.6)	2.9 (2.7)	0.9 (0.01, 1.7)	0.3 (–0.6, 1.1)	0.6 (–0.3, 1.4)	
Pain Intensity (0–10)							0.01
13 weeks	3.3 (2.5)	2.9 (2.9)	2.6 (2.7)	0.9 (0.1, 1.8)	0.6 (–0.3, 1.5)	0.3 (–0.6, 1.2)	
52 weeks	4.2 (2.4)	3.1 (2.9)	4.1 (2.9)	0.5 (–0.4, 1.3)	–0.6 (–1.4, 0.3)	1.0 (0.1, 1.9)	
NDI (0–50)							0.06
13 weeks	7.2 (6.7)	6.4 (6.7)	6.5 (7.1)	1.9 (–0.2, 4.0)	0.9 (–1.2, 3.0)	1.0 (–1.1, 3.2)	
52 weeks	7.2 (7.5)	6.3 (8.0)	8.5 (7.4)	–0.02 (–2.3, 2.3)	–1.1 (–3.4, 1.2)	1.1 (–1.3, 3.4)	
Main Functional Limitation (0–10)							0.01
13 weeks	4.3 (3.2)	3.4 (3.1)	3.3 (3.2)	1.2 (0.2, 2.2)	0.7 (–0.4, 1.7)	0.5 (–0.5, 1.5)	
52 weeks	5.3 (3.1)	3.9 (3.1)	4.7 (3.3)	0.8 (–0.2, 1.8)	–0.3 (–1.3, 0.8)	1.0 (–0.01, 2.0)	
Flexion-Extension (degrees)‡							0.004
13 weeks	14.4 (20.2)	7.0 (21.3)	3.6 (23.0)	8.7 (2.6, 14.9)	1.8 (–4.3, 8.0)	6.9 (0.7, 13.2)	
52 weeks	16.8 (20.1)	9.3 (24.2)	6.6 (23.0)	8.1 (1.7, 14.5)	1.1 (–5.3, 7.5)	7.0 (0.5, 13.6)	
Mean Self-Rated Health (0–100)							0.02
13 weeks	11.3 (16.5)	5.4 (15.2)	5.6 (18.6)	5.8 (0.7, 11.0)	3.1 (–2.1, 8.3)	2.8 (–2.5, 8.0)	
52 weeks	11.8 (17.1)	4.0 (19.9)	10.0 (19.4)	2.0 (–3.5, 7.5)	–1.8 (–7.4, 3.8)	3.8 (–1.9, 9.4)	

*Columns 2, 3, and 4 present the improvement from baseline, either in number of patients (percentages) or means (standard deviations). A higher score indicates a more favorable outcome. Columns 5, 6, and 7 present the unadjusted differences in success rates for perceived recovery and the differences of the mean improvements from baseline (with a 95% CI between MT, PT, and continued care by the GP. Positive values indicate improvement for MT, PT, or GP, respectively (columns 5, 6, and 7) and negative values the opposite. Column 8 shows *P* values for the differences in effect over the three groups (MT, PT, and GP) obtained by Cox regression or repeated measures ANCOVA (including available measurements at 3, 7, 13, 26, and 52 weeks).

†Mean difference and 95% CIs are adjusted for the baseline value of the respective outcome (ANCOVA).

‡Results for lateral flexion and rotation showed a similar trend, although statistical testing yielded only significant results for lateral flexion.

TABLE 2. Number and Type of Additional Treatments at 7 and 52 Weeks

	0–7 Weeks		7–52 Weeks		Total No. of Patients (%) Receiving Additional Treatment 0–52 Weeks†
	n	Additional Treatment*	n	Additional Treatment*	
Manual therapy (n = 60)	5	GP care	14	Manual therapy	18 (30.5%)
	1	Exercise	9	Physical therapy	
			11	GP care	
Physical therapy (n = 59)	7	GP care	3	Exercise	34 (57.6%)
			11	Manual therapy	
			32	Physical therapy	
			13	GP care	
GP care (n = 64)	1	Exercise	1	Exercise	40 (62.5%)
	7	Manual therapy	34	Manual therapy	
	1	Physical therapy	15	Physical therapy	
	3	Exercise	37	GP care	
	2	Manipulation	5	Exercise	
			2	Manipulation	

*Exercise, exercise therapy according to Mensendieck; Manipulation, includes spinal manipulation by chiropractor or general practitioner.

†Includes patients who received more than one type of additional treatment (eg, PT and MT).

are performed in clinical practice. Therefore, this pragmatic design is most appropriate to answer our clinical research question.

Before randomization, we asked the participants about their preference for one of the three treatments. About 50% of the participants had no preference; only 2% preferred to be treated by the GP, 19% preferred PT, and 29% preferred MT. Because of the small numbers with clear preferences, stratification of results for patients who did and did not receive their preferred treatment was not possible. We examined the influence of preferred treatment in the analysis, but this did not affect the results.

Recent systematic reviews indicate that the evidence is weak for any type of conservative treatment of neck pain.^{10,30} Trials are heterogeneous with regard to the reported interventions, populations, and outcomes.^{10,11,13,30} Despite the limited number of studies, multimodal treatment, including some form of MT (mobilization or manipulation) and exercise, may be of some benefit.¹⁰ MT and exercises are often combined in the treatment strategies used by physical therapists.³¹

Since 1998 a few other large randomized clinical trials^{32–35} on multimodal treatments and neck pain have been published, but they have not yet been included in published systematic reviews.^{9–11} Bronfort et al³² compared 20 sessions of chiropractic spinal manipulation, massage, and low-technology progressive strengthening exercises with rehabilitative strengthening exercises on MedX equipment, stretching, and aerobic exercise to manipulation alone. Patients received home exercises in all groups. Despite improvements in strength in the exercise groups, no treatment was superior. Jordan et al³⁴ compared an exercise program of strengthening and stretching in a group setting with PT including hot packs, massage, ultrasound, manual traction, spinal mobilization, proprioceptive neuromuscular facilitation, and ergonomic training with chiropractic cervical manipulation alone. All patients received home exercises and advice and participated in a neck school of 1.5 hours. No

differences were detected between the groups. In a factorial design, Hurwitz et al³³ compared chiropractic manipulation with or without heat, and mobilization with or without electrical muscle stimulation, and found no differences between the groups. These recent trials all include different combinations of interventions performed by either chiropractors or physiotherapists, and it appears no treatment is convincingly better than another.

Trials that include a comparison group consisting of a minimal treatment strategy such as medication, counseling by a GP, or just home exercises are scarce^{34,35} but show more success in favor of MT or PT. This offers perhaps an explanation why our results especially favor MT compared with GP care.

Current guidelines for the management of neck pain are scarce,^{30,36} but like the related field of whiplash³⁷ and low back pain,^{16,37,38} there is concordance among authors regarding the early and gradual activation of patients and the promotion of physical activity and exercise. Although MT includes passive manual techniques, the treatment plan for MT (and PT and GP care alike) is also aimed at gradual activation of the patient and return to normal daily activities (through education, advice, and home exercises).^{8,31} Multimodal treatments provided by physical therapists, as presented in this trial, are common in RCTs on neck pain.^{9,10,39} As several treatment components were combined in each treatment strategy, their true individual or interactive effects could not be evaluated. For example, although mobilization was considered a dominant treatment component in the MT group, its effects cannot be disentangled from the effects from other treatment components, including stabilization and coordination exercises, muscular mobilization techniques, education, advice, and home exercises.

In conclusion, this study shows that after MT had speeded up recovery in the short term, GP and PT treatment caught up in the long term, and differences between the three treatment groups at 12 months of follow-up were small and no longer statistically significant.

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